IIAR 8

Decommissioning of Closed-Circuit Ammonia Refrigeration Systems

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Public Review #2

Notes on the Standard Text

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This Standard includes both Normative (required) and Informative (advisory) language. The bodies of the standard and labeled Appendices are Normative. The Foreword, Notes, and any Appendices labeled Informative are non-mandatory. Informative material shall never be regarded as a requirement.

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Foreword (Informative)

This Standard specifies minimum criteria for removing the ammonia charge in conjunction with the decommissioning of closed-circuit ammonia refrigeration systems. Additional requirements may be imposed by particular circumstances, system design, or jurisdictional considerations. This document reflects the consensus reached by ammonia refrigeration industry representatives but does not constitute a comprehensive, detailed technical manual and should not be used as such.

For the purposes of this Standard, it is assumed that the refrigeration system was designed for the duty that it was to perform, that all installed piping and electrical equipment is fully functional and that adequate access is available for the safe removal of the charge. Since this document defines the minimum requirements for the decommissioning of closed-circuit ammonia refrigeration systems, it may not be sufficient to meet other standards and/or regulations that are applicable to specific refrigeration systems.

Experience shows that ammonia is very difficult to ignite and is very stable under normal conditions. The ignition point of ammonia is limited to a range of 160,000 ppm to 250,000 ppm. This concentration far exceeds the 50 ppm permissible exposure level published by OSHA.

Ammonia's strong odor alerts those nearby to its presence at levels well below those that present a hazard. This "self-alarming" odor is so strong that a person is unlikely to voluntarily remain in an area where ammonia concentrations are hazardous.

The principal hazard to persons is ammonia vapor, since exposure occurs more readily by inhalation than by other routes. As with any hazardous vapor, adequate ventilation is the key to effective control.

Ammonia in vapor form is lighter than air. Typically, ammonia vapor rises and diffuses simultaneously when released into the atmosphere. It is biodegradable, and when released it combines readily with water and/or carbon dioxide to form relatively harmless compounds. Ammonia may also neutralize acidic pollutants in the atmosphere. Additional information regarding the properties of ammonia is published in the IIAR Ammonia Data Book.

At the time of publication of this Standard for the Decommissioning of Closed-Circuit Ammonia Refrigeration Systems, the IIAR Standards Review Committee had the following members:

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Section 1

Purpose

This Standard specifies minimum criteria and procedures for decommissioning of closed-circuit ammonia refrigeration systems.

Section 2

Scope

2.1 This Standard provides minimum criteria and procedures for the safe removal of an ammonia charge ~~and~~ in conjunction with the decommissioning of closed-circuit ammonia refrigeration systems. The specific requirements for a particular system shall be considered when applying the minimum requirements~~general recommendations~~ expressed in this Standard.

2.2 This Standard refers to those parts of a closed-circuit ammonia refrigeration system that are in direct contact with ammonia, including components that are temporally connected to the system or system components that are to be decommissioned, for example portable ~~pump-out~~ compressors and hoses.

2.3 Unless otherwise noted, it is the responsibility of the owner or the owner's representative to meet the objectives of this Standard as they pertain to their particular closed-circuit refrigeration system or systems. It is permissible for the owner or the owner's representative to delegate this responsibility by contract.

2.4 This Standard shall apply to complete systems that are decommissioned and/or to those parts of a system that are decommissioned.

2.5 This Standard shall apply to systems or parts thereof whether they are dismantled and removed or abandoned in place.

2.6 This Standard shall not apply to the shutdown of closed-circuit ammonia refrigeration systems that operate periodically or seasonally or are otherwise mothballed periodically whether or not the ammonia charge is isolated or removed. In addition, this Standard shall not apply to ~~pump-downs or~~ ammonia charge removal for system maintenance or servicing.

2.7 This Standard shall not apply to ammonia absorption refrigeration systems.

2.8 Informative material shall never be regarded as a requirement (see: Notes on the Standard Text inside front cover).

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Section 3

Definitions

For other definitions refer to ANSI/IIAR 1 (Reference 4.1.1).

Decommissioning: The permanent deactivation of a closed-circuit refrigeration system or part thereof from service including the removing or transferring of the entire ammonia charge from the system or part thereof.

~~**Pump-out:** Reduction in pressure of the ammonia to a pre-determined pressure level for the purpose of removing or transferring the entire ammonia charge from the closed-circuit refrigeration system or part thereof.~~

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Section 4

References

4.1 Normative References

4.1.1 International Institute of Ammonia Refrigeration (IIAR), ANSI/IIAR 1, latest edition, *Definitions and Terminology Used in IIAR Standards.*

4.1.2 International Institute of Ammonia Refrigeration (IIAR), ANSI/IIAR 2, latest edition, *Equipment, Design and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems.*

4.1.3 Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, 29 CFR Part 1910.119, *Process Safety Management of Highly Hazardous Chemicals.*

4.1.4 Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, Latest Editions:

4.1.4.1 29 CFR Part 1910.132, *General Requirements, Personal Protective Equipment*

4.1.4.2 29 CFR Part 1910.133, *Eye and Face Protection*

4.1.4.3 29 CFR Part 1910.134, *Respiratory Protection*

4.1.4.4 29 CFR Part 1910.146, *Permit-Required Confined Spaces*

4.1.4.5 29 CFR Part 1910.147, *The Control of Hazardous Energy*

4.1.4.6 29 CFR Part 1910.252, *General Requirements, Welding, Cutting and Brazing*

4.1.5 Environmental Protection Agency (EPA), 40 CFR Part 68, Chemical Accident Prevention Provisions.

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Section 5

Preparation

5.1 Initial Planning

5.1.1 The following items shall be considered when developing an initial plan to ~~pump-out and~~ decommission a close-circuit refrigeration system:

5.1.1.1. The reason or reasons that the system or parts there-of are to be ~~pumped-out and/or~~ decommissioned. ~~If the system is being pumped-out and/or decommissioned due to a change in production requirements care may need to be taken to ensure that the equipment, components and piping can be placed back in service at a later date. If the system is being pumped-out and/or decommissioned because it is in poor condition such care may not be necessary.~~

5.1.1.2. Designation of the person(s) coordinating the ~~pump-out and~~ decommissioning activities.

5.1.1.3. If the complete system is not to be decommissioned, specify the refrigeration equipment, components and piping that will be ~~pumped out, and those parts that will be~~ decommissioned. Determine if there are any additional risks due to the physical and operational condition of the equipment, components and piping and the approximate amount of ammonia that will be removed.

5.1.1.4. Areas at the facility that will be shut down and/or the personnel to be evacuated during the ~~pump-out and~~ decommissioning activities. ~~The preferred method is to have the facility shut down during the pump-out and decommissioning activities. If it is impractical to shut down the entire facility, the areas involved in the pump-out and decommissioning activities shall be clearly designated and restricted.~~

5.1.1.5. Location where the ammonia, lubricating oil and other chemicals that are to be removed from the system will be transferred to and/or stored.

5.1.1.6. Means used to dispose of any ammonia, lubricating oil and other chemicals removed from the system.

~~**5.1.1.7.** Equipment, components and piping in the refrigeration system that will remain in service after the decommissioning activities are completed.~~

5.1.1.7. A list of the ~~Specific refrigeration~~ equipment, components and piping that will be dismantled or abandoned and left in place shall be developed.

5.1.1.8. The "Management of Change Procedures" ~~or the "Change Procedures"~~ which are applicable to the ~~shall be initiated to address the~~ ~~pump-out and~~ decommissioning activities. Consult Section 5.6~~.2~~ for a description of these procedures.

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5.2 Documentation Requirements

5.2.1 The following documents shall be available when developing the initial plan to ~~pump-out and~~ decommission a closed-circuit refrigeration system:

5.2.1.1. Documents that describe the physical properties and the potential hazards of anhydrous ammonia, lubricating oil and other chemicals involved in the ~~pump-out and~~ decommissioning activities such as material safety data sheets (MSDSs), safety data sheets (SDSs) and the IIAR *Ammonia Data Book*.

5.2.1.2. Refrigeration system flow diagrams and/or piping & instrumentation diagrams (P&IDs) depicting the refrigeration system or subsystem that will be ~~pumped out and~~ decommissioned.

5.2.1.3. A facility plan view showing the orientation of the facility and the general location of the ammonia refrigeration system or subsystem that will be ~~pumped out and~~ decommissioned.

5.2.1.4. Information describing the location and setpoint of any pressure relief valves installed on equipment, components and piping that will be ~~pumped out and~~ decommissioned.

5.2.1.5. Emergency action and/or response plan for the facility.

~~**5.2.2** Where available, the following documents shall be considered when developing the initial plan to pump-out and decommission a closed-circuit ammonia refrigeration system:~~

5.2.1.6. Information describing the maximum allowable pressure and the minimum design temperature for the equipment, components and piping that will be ~~pumped out and~~ decommissioned such as manufacturer's data reports.

5.3 Coordination Meeting(s)

5.3.1 Coordination meeting(s) shall be held with personnel who will be directly involved in the ~~pump-out and~~ decommissioning activities. Items that shall be addressed (if applicable) during the meeting(s) include:

5.3.1.1 Decide whether to suspend and/or modify daily operations at the facility during the ~~pump-out and~~ decommissioning activities.

5.3.1.2 Identify areas at the facility that need to be restricted during the ~~pump-out and~~ decommissioning activities to limit ~~personnel~~ access to authorized personnel. ~~Options that shall be considered include using "Caution" tape, barricades and/or posting personnel at key locations to restrict access to these areas.~~

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"Caution" tape, barricades and/or posting personnel at key locations may be used to restrict access to these areas.

5.3.1.3 Identify any changes to the site security procedures that are necessary during ~~pump-out and~~ decommissioning activities.

5.3.1.4 Decide whether to limit and/or control access by motorized vehicles (such as tank trucks and forklifts) during the ~~pump-out and~~ decommissioning activities.

5.3.1.5 Identify the vessels, tank trucks or tanks that will be used to accumulate any ammonia that is being transferred and ensure that they are designed for ammonia service.

5.3.1.6 Determine where any tank truck(s) will be parked and what connections will be used on the ammonia refrigeration system so that ammonia can be transferred from the system into the tank truck(s).

5.3.1.7 Determine if any additional labels, signs or placards need to be installed during the ~~pump-out and~~ decommissioning activities such as temporary emergency exit signs.

5.3.1.8 Identify any inspections and associated precautions that shall be taken prior to the ~~pump-out and~~ decommissioning activities.

5.3.1.8.1 If any hoses will be used to transfer ammonia; define the steps used to inspect and/or test the hoses prior to these activities to ensure that the hoses are designed for use in the conveyance of ammonia and that the expiration date(s) for use has not been exceeded.

5.3.1.9 Determine what procedures shall be followed to remove, transfer and/or flush ammonia during ~~pump-out and~~ decommissioning activities including:

5.3.1.9.1 The procedures that shall be followed to heat any components in the system.

5.3.1.9.2 The procedures that shall be followed to remove any ammonia or lubricating oil that may accumulate in low points in the system.

5.3.1.9.3 The procedures that shall be followed before cutting into and removing equipment, components and piping in the system.

5.3.1.9.4 The procedures that shall be followed to physically remove equipment, components and piping from the facility and/or isolate equipment, components and piping that will be abandoned in place.

5.3.1.10 Determine if any check valves, vent valves, drain valves, isolation valves and/or pressure relief valves need to be modified and/or installed for the ~~pump-out and~~ decommissioning activities.

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5.3.1.11 Determine if any instrumentation such as temperature and pressure gauges need to be modified and/or installed for the ~~pump-out and~~ decommissioning activities.

5.3.1.12 Determine if any insulation needs to be removed to facilitate the ~~pump-out and~~ decommissioning process.

5.3.1.13 Determine if changes are required so that the equipment, components and piping can be safely accessed.

5.3.1.14 Identify the pressure and temperature limitations of the equipment, components and piping involved in the ~~pump-out and~~ decommissioning activities.

5.3.1.15 Determine what communication equipment will be required so that key personnel can be readily contacted during these activities.

5.3.1.16 Determine what personal protective equipment (PPE) shall be worn when performing ~~pump-out and~~ decommissioning activities.

NOTE:

The IIAR's *Introduction to Ammonia Refrigeration* contains a description of personal protective equipment applicable to ammonia that can be adjusted to suit the specific activities performed at the facility~~ and incorporated into the pump-out and decommissioning operating procedures~~.

5.3.1.17 Ensure that equipment for quick drenching and flushing of the eyes and body, such as eyewash and body showers, will be available for immediate emergency use in areas where activities could expose personnel to ammonia.

5.3.1.18 Determine how ammonia releases will be detected during the ~~pump-out and~~ decommissioning activities. Options that shall be considered include the use of fixed ammonia detectors and/or portable ammonia detection devices during these activities.

5.3.1.19 Determine how equipment, components and piping can be shut down and isolated in an emergency during the ~~pump-out and~~ decommissioning activities and identify the personnel who would respond to these emergencies.

5.3.1.20 Determine how ~~to use and/or modify~~ the facility ventilation systems will be operated during the ~~pump-out and~~ decommissioning activities.

NOTE:

Options ~~requiring consideration~~ include shutting off facility HVAC unit(s), running machinery roof ventilation system(s) continuously, and/or providing portable ventilation units during these activities.

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5.3.1.21 Determine how the ammonia, lubricating oil and other chemicals will be disposed of in compliance with applicable regulations.

5.3.1.22 Determine the manpower requirements for the ~~pump-out and~~ decommissioning activities including when the buddy system shall be practiced.

5.3.1.23 Determine whether additional training is needed for the personnel involved in the ~~pump-out and~~ decommissioning activities.

5.3.1.24 Determine if the emergency action and/or response plan needs to be modified to address the ~~pump-out and~~ decommissioning activities. Issues that shall be addressed include release reporting and evacuation procedures.

5.3.2 Local representatives including the Fire Department and the Local Emergency Planning Committee (LEPC) shall be contacted in advance of the ~~pump-out and~~ decommissioning activities and provided a summary of the activities that will take place for those activities where there may be significant risk of an ammonia release.

5.4 ~~Written Operating Procedures~~Decommissioning Precautions and Steps

5.4.1 ~~Written operating procedures~~ Specify in writing~~shall be developed to specify~~ the precautions and ~~the~~ general steps that shall be followed during ~~pump-out and~~ decommissioning activities~~. The written procedures shall~~ includinge (as applicable):

5.4.1.1 A description or list of the items discussed during coordination meeting(s) held with personnel who will be directly involved in the ~~pump-out and~~ decommissioning activities (see Section 5.3).

5.4.1.2 References to existing safety programs such as lockout/tagout, line breaking, hot work permit and confined space entry procedures.

NOTE:

Facilities in the United States shall comply with applicable OSHA standards which address these safety programs (Reference 4.1.4).

5.4.1.3 Description of safety systems that will be functional such as ammonia detection systems, ventilation systems, pressure relief systems and emergency shutdown systems.

5.4.1.4 Steps that shall be taken during ~~pump-out and~~ decommissioning activities.

5.4.1.5 Precautions that shall be taken during ~~pump-out and~~ decommissioning activities including:

5.4.1.5.1 Precautions that shall be taken to prevent trapping liquid ammonia when closing valves to isolate system components or piping. Hydrostatic pressure can develop when liquids become trapped with no gases present. Whenever this is a

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possibility the sequence of steps shall assure that liquid has been removed from the system component(s) to be isolated before the last isolation valve is closed.

5.4.1.5.2 Precautions that shall be taken to ensure that temperatures do not go below the minimum design temperature of any equipment, components and piping during the ~~pump-out and~~ decommissioning activities including precautions taken to address the flashing of subcooled liquid ammonia.

5.4.1.5.3 Precautions that shall be taken to ensure that the pressure does not go above the maximum allowable pressure of any equipment, components and piping during the ~~pump-out and~~ decommissioning activities.

5.4.1.5.4 Precautions that shall be taken to avoid the rapid release of pressure from one portion of the system to another portion of the system.

5.4.1.5.5 Precautions that shall be taken to avoid ammonia liquid being released into equipment, components and piping that is under vacuum.

5.4.1.5.6 Precautions that shall be taken to ensure that the liquid levels stay within safe limits in the vessels during the ~~pump-out and~~ decommissioning activities.

5.4.1.5.7 Precautions that shall be taken to avoid any excessive vibrations, shocks or movement of equipment, components and piping in the system.

5.3.1.5.8 Precautions taken to ensure that valves will not be inadvertently opened or closed during decommissioning activities such as a list of the valves which will be marked or flagged during these activities.

5.4.1.6 Steps that shall be taken to shut down and isolate equipment, components and piping in an emergency during the ~~pump-out and~~ decommissioning activities including the identification of the personnel who would respond to these emergencies.

5.5 Training

5.5.1 Additional training shall be provided, where necessary, to those facility personnel and/or contractors performing the ~~pump-out and~~ decommissioning activities. The training shall include (as applicable):

5.5.1.1 An overview of the ~~pump-out and~~ decommissioning activities.

5.5.1.2 A description of the safety, health hazards and properties of ammonia, lubricating oil and other chemicals involved in the ~~pump-out and~~ decommissioning activities including first aid for exposure to these chemicals.

5.5.1.3 A review of the items considered during the initial planning stages. See Section 5.1 for a list of these items.

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5.5.1.4 A review of the items reviewed during the coordination meeting(s). ~~–~~See Section 5.2 for a list of these items.

5.5.1.5 A review of the operating limits that are applicable such as the expected temperatures, pressures and levels anticipated during these activities.

5.5.1.6 A description of the actions that shall be taken if the operating limits deviate from the expected values.

5.5.1.7 A review of the decommissioning precautions and general steps ~~operating procedures for each operating phase including the sequence of operations, the steps involved, and the precautions~~ that shall be followed during the ~~pump-out and~~ decommissioning activities (see Section 5.4).~~Refer to Section 5.4 for a description of the items that shall be included in the operating procedures.~~

5.5.1.8 A review of emergency action and/or response operations including the steps that shall be taken to shut down and isolate equipment, components and piping in an emergency.

5.5.1.9 A review of safety programs such as lockout/tagout, line breaking, hot work permit and confined space entry procedures applicable to these activities.

5.5.2 Awareness training shall be provided where necessary to all personnel who could be affected by the ~~pump-out and~~ decommissioning activities. The awareness training shall include (as applicable):

5.5.2.1 An overview of the ~~pump-out and~~ decommissioning activities including the effect of these activities on the daily operations at the facility.

5.5.2.2 A description of the safety, health hazards and properties of ammonia, lubricating oil and the other chemicals involved in the ~~pump-out and~~ decommissioning activities including first aid for exposure to these chemicals.

5.5.2.3 A review of emergency action and/or response procedures including how to initiate an alarm, release reporting procedures and evacuation procedures.

5.5.3 Regular (daily or weekly) safety meetings that include facility personnel and/or contractors performing the ~~pump-out and~~ decommissioning activities shall be conducted. The safety meetings shall include (as applicable):

5.5.3.1 A review of daily work activities to be accomplished.

5.5.3.2 A review of safety practices that shall be followed to support these activities.

5.5.3.3 Address any concerns regarding the ~~pump-out and~~ decommissioning activities to be accomplished.

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5.5.4 Records shall be kept to document the training provided and the safety meetings held. These records shall include (as applicable):

5.5.4.1 Training summary sign-off sheets.

5.5.4.2 Agendas, handouts, manuals, and attendance lists from any training activities.

~~**5.5.4.3** Copies of examination questions and a list documenting test results.~~

5.5.4.3 Documents showing special qualifications achieved from outside organizations such as welding certifications or training on the use of personal protective equipment such as respirators.

5.6 Regulatory Requirements

5.6.1 ~~Pump-out and d~~Decommissioning activities shall comply with applicable codes, standards and regulations.

NOTE:

~~In the United States, all facilities are subject to EPA's General Duty Clause requirements (Section 112(r)(l) of the Clean Air Act) and to the General Duty Clause in section 5(a)(1) of the Occupational Safety and Health Act (29 U.S.C. § 654(a)(1)). There are additional requirements if the ammonia refrigeration system is covered by OSHA's Process Safety Management (PSM) Standard (Reference 4.1.3), the USEPA's Risk Management Program (RM Program) Regulation (Reference 4.1.5), or state regulations that exceed minimum requirements.~~

~~**5.6.2**~~ A "Management of Change Procedure" shall be initiated if the facility is subject to the OSHA Process Safety Management (PSM) Standard and the EPA Risk Management Program (RM Program) Regulation. ~~If the facility is not subject to these regulations, a "Change Procedure" shall be followed to comply with the facility's Ammonia Refrigeration Management (ARM) program.~~ Items that are typically addressed as part of the change procedures include:

~~**5.6.2.1**~~ a. Review of the impact on safety and health during the ~~pump-out and~~ decommissioning activities.

~~**5.6.2.2**~~ b. Identification of the documentation to be modified to reflect the pump-out and decommissioning activities including, as applicable:

~~a~~1. Ammonia inventory.

~~b~~2. Refrigeration system flow diagrams and/or piping & instrumentation diagrams (P&IDs).

~~c~~3. Facility plan view(s) and/or site plan(s).

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~~d~~4. Equipment list.

~~e~~5. Desired system operating ranges.

~~f~~6. Safety systems.

~~g~~7. Pressure relief system design basis.

~~h~~8. Ventilation system design basis.

~~i~~9. ~~Written o~~Operating procedures.

~~j~~10. Safe work practices.

~~k~~11. Operator training program.

~~l~~12. Contractor program.

~~m~~13. Visitor safety program.

~~n~~14. Preventive maintenance schedules and/or procedures.

~~o~~15. Emergency action and/or response plan.

~~**5.6.2.3 Documentation of training associated with the pump-out and decommissioning activities.**~~

~~**5.6.2.3**~~ c. Pre-startup procedures associated with the ~~pump-out and~~ decommissioning activities.

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Section 6

Equipment

6.1 Equipment Requirements

6.1.1 The specific consumables, tools and equipment that shall be available during the ~~pump-out and~~ decommissioning activities shall be identified during the preparation stage (see Section 5).

NOTE:

This equipment may include:

a. "Caution" tape and/or barricades.

b. Additional labels, signs and placards.

c. Tank trucks, drums and/or tanks that can be used to contain and/or store ammonia, lubricating oil and other chemicals removed from the system.

d. Compressors, ammonia pumps, or vacuum pumps that can be used to raise/lower pressure during these activities.

e. Equipment that can be used to safely apply heat to equipment, components and piping during these activities.

f. A supply of inert gas, such as nitrogen or air, which can be used to flush the lines and equipment, components and piping after ammonia has been removed.

g. Additional check valves, vent valves, drain valves, isolation valves and/or pressure relief valves that need to be installed to facilitate these activities.

h. Additional instrumentation such as temperature and pressure gauges that need to be installed during these activities.

i. Components used to connect equipment, tank trucks, and/or tanks to the system such as portable hoses that are designed for ammonia service.

j. Equipment such as portable lifts that could be used to safely access the equipment, components and piping.

k. Fixed ammonia detectors and/or portable ammonia detection devices that can be used to detect ammonia levels during the ~~pump-out and~~ decommissioning activities.

l. Equipment that can be used to shut down and isolate the system or parts of the system in an emergency.

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m. Fixed ventilation units and/or portable ventilation units for use during these activities.

n. Equipment that will be used to dispose of ammonia, lubricating oil and other chemicals after they have been removed from the system.

6.2 Materials

6.2.1 All equipment and materials used during ~~pump-out and~~ decommissioning activities shall be designed for ammonia refrigerant at the coincident temperature and pressure to which the component shall be subjected. No materials shall be used that will deteriorate because of the presence of ammonia or lubricating oil, or a combination of both, or any normal contaminant such as air or water.

NOTE:

The equipment, components and piping may be exposed to lower temperatures and lower pressures during ~~pump-out and~~ decommissioning activities than during normal operations.

NOTE:

See ANSI/IIAR 2 (Reference 4.1.2) for a description of materials.

6.3 Maintenance of Equipment and Tools

6.3.1 All equipment and tools used during ~~pump-out and~~ decommissioning activities shall be properly maintained and in good working order.

~~**6.3.1.1** Maintenance schedules shall be examined to ensure that the inspection and testing frequencies for all equipment and tools used during the pump-out and decommissioning activities have followed recommended and generally accepted good engineering practices. If necessary, additional tests and inspections shall be completed before the pump-out and decommissioning activities begin.~~

6.3.1.~~2~~1 Special attention shall be taken to ensure that the following items will function properly during ~~pump-out and~~ decommissioning activities:

a. Hoses rated for ammonia service and within their service life.

b. Eyewash and body showers.

c. Fixed ammonia detectors and portable ammonia detectors.

d. Equipment that would be used to shut down and isolate the system or parts of the system in an emergency.

e. Fixed ventilation units and/or portable ventilation units for use during these activities

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Section 7

Operations

7.1 Prepare Facility

7.1.1 The specific preparations needed before ~~pump-out and~~ decommissioning activities commence shall be identified during the preparation stage (see Section 5). These preparations may include:

7.1.1.1 Suspend and/or modify operations at the facility as described in Section 5.3.1.

7.1.1.2 Ensure that decommissioning precautions and general steps ~~written operating procedures~~ have been written ~~developed~~ (see Section 5.4).

7.1.1.3 Ensure that training and safety ~~(tailgate)~~ meetings have been completed (see Section 5.5).

7.1.1.4 Ensure that regulatory requirements have been ~~met including the "Management of Change Procedures" or the "Change Procedures"~~. (see Section 5.6).

7.1.1.5 Assemble and/or install the specific equipment and tools that shall be available during the ~~pump-out and~~ decommissioning activities (see Section 6).

7.1.1.6 Assemble the manpower needed for the ~~pump-out and~~ decommissioning activities.

NOTE:

Appendix C (Informative) contains a sample decommissioning check list that may be used to confirm that the preparations have been completed.

7.2 ~~Pump-Out and~~ Decommissioning Activities

7.2.1 The precautions and general steps ~~and precautions~~ that will be followed during the ~~pump-out and~~ decommissioning activities shall be documented ~~in the written operating procedures~~ (see Section 5.4). These steps typically include:

7.2.1.1 Raising/lowering pressure on the system components to transfer ammonia to a ~~pump-out~~ vessel, tank truck and/or tank.

NOTE:

Often ammonia will be removed from the evaporators and the piping manifolds before it is removed from the main vessels in the machinery room. Once liquid has been removed from the evaporators and piping, a vacuum is often placed on the piping and evaporators to remove residual ammonia vapors.

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NOTE:

Precautions shall be taken to ensure that residual ammonia vapors are not discharged directly to the atmosphere. Options include transferring these vapors to a collection vessel or purging these vapors into water.

7.2.1.2 Using vessels, tank trucks, and/or tanks to accumulate any ammonia that is being transferred.

NOTE:

Once ammonia has been removed from evaporators and piping, the liquid ammonia that has accumulated inside the machinery room vessels can be removed into a tank truck and/or tank(s).

7.2.1.3 Safely applying heat to a system component to evaporate residual liquid ammonia. Fuel-burning appliances having open flames and that use combustion air from the area near the system shall not be used to evaporate residual ammonia in the system.

NOTE:

External heat application options include: ambient temperature water (provided the ammonia pressure is above 32°F equivalent); hot water (approximately 180°F); low pressure (less than 15 psig) steam; and hot air guns. Hot ammonia vapor is ineffective for vaporizing liquid ammonia. However, depending on the geometry of the equipment, components or piping, ammonia vapor can effectively displace liquid ammonia.

7.2.1.4 Using service valves to safely remove any remaining ammonia and/or lubricating oil that may accumulate in low points in the system.

7.2.1.5 Flushing the system or subsystem with an inert gas, such as nitrogen, to remove any residual ammonia vapor ~~following the pump-out activities~~. Precautions shall be taken to ensure that the gas used to flush the system is not discharged directly to the atmosphere if it contains residual ammonia. One option is to purge these gases into water.

NOTE:

The disposal of all chemicals, including ammonia/water solutions, shall be in compliance with applicable codes, standards and regulations.

7.2.1.6 Physically removing equipment, components or piping from the refrigeration system following lockout/tagout, line breaking, hot work permit and confined space entry procedures where applicable.

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Do not use cutting torches if the equipment, components or piping could contain residual ammonia or oil.

Section 8

Ammonia Disposal

8.1 General

8.1.1. The method used to dispose of ammonia, lubricating oils and other chemicals shall be identified during the preparation stage (see Section 5).

8.2 Issue Related to Ammonia Disposal

8.2.1 Issues that shall be considered when disposing of ammonia, lubricating oils and other chemicals include:

8.2.1.1 Ensure that lubricating oil that might contain residual ammonia is completely de-gassed before being placed in a sealed non-pressure containing lubricant receptacle.

8.2.2.2 The disposal of all chemicals, including ammonia/water solutions, shall be in compliance with applicable codes, standards and regulations.

8.2.2.3 Obtain tracking information such as shipping waybills and endpoint receipts to document the disposal of all chemicals removed from the facility.

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Section 9

Close-out

9.1 General

9.1.1 Section 5 summarizes the codes, standards and regulations that may apply to ~~pump-out and~~ decommissioning activities. Once the ~~pump-out and~~ decommissioning activities are completed, the following close-out activities shall be completed where applicable.

9.2 ~~Management of~~ ~~**Change Procedures**~~ **Updated Facility Documentation**

~~**9.2.1** Section 5.6.2 summarizes the items that are typically addressed as part of the Management of Change or the Change Procedures. Once the pump-out and decommissioning activities are completed, the Change Fform(s) used to document these activities shallmust be completed. Typically this involves:~~

~~**9.2.1.1**~~ **9.2.1** Ensure that facility documentation has been updated. See Section 5.6.2 for a list of documentation that may need to be updated.

~~**9.2.1.2**~~ **9.2.2** Ensure that any action items identified have been addressed and that the resolution of these action items has been documented.

~~**9.2.1.3**~~ **9.2.3** Ensure that the training associated with the ~~pump-out and~~ decommissioning activities has be completed and properly documented.

~~**9.2.1.4** Ensure that the pre-startup procedures have been completed and documented if applicable.~~ Complete the "Management of Change Procedures" which are applicable to the decommissioning activities. Consult Section 5.6 for a description of these procedures.

~~**9.2.1.5** Ensure that authorization signature(s) have been obtained on the form(s).~~

9.3 Notification Procedures

9.3.1 Government agencies shall be notified once the ~~pump-out and~~ decommissioning activities are completed, including:

9.3.1.1 Notify representatives from the Fire Department and the Local Emergency Planning Committee (LEPC).

NOTE:

This notification may be accomplished by submitting a copy of the updated emergency action and/or response plan for the facility to these representatives.

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9.3.1.2 Notify applicable government agencies.

NOTE:

The following requirements apply in the United States:

a. The RMP*eSubmit User's Manual contains instructions to de-register a facility from the US EPA's Risk Management Program Rule if the ammonia inventory in the process drops below the threshold in this Rule. The process involves submitting a letter to the RMP Reporting Center within six months of the change.

b. Facilities are required to submit an annual inventory report for each hazardous chemical as defined by the Emergency Planning and Community Right-to-Know Act (EPCRA). The Tier I and/or Tier II reports shall be updated to reflect any changes in the ammonia inventory which occurred during decommissioning activities. Tier I and Tier II forms and instructions may be obtained on-line from the US EPA.

c. Facilities are required to submit a Section 313 report ("Form R") for each toxic chemical exceeding a threshold by July 1 in the following year to the US EPA and to the State Emergency Response Commission (SERC).. Form R reporting forms and related guidance may be obtained on-line from the US EPA.

d. The Chemical Security Assessment Tool (CSAT) Top-Screen Survey Application User Guide contains instructions on the procedures that shall be followed to update facility information in the CSAT system used by the US Department of Homeland Security (DHS).

~~**9.4 Removal of Pressure Vessels**~~

~~**9.4.1**~~ e. If a pressure vessel is removed from service, the authority having jurisdiction (AHJ) shall be notified if required by applicable codes.

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Appendix A (Informative)

Informative References

A.1 IIAR *Ammonia Data Book*

A.2 IIAR *Introduction to Ammonia Refrigeration*

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Appendix B (Informative)

Sources of All References

American National Standards Institute (ANSI)
11 West 42nd Street
New York, NY 10036, USA
www.ansi.org

International Institute of Ammonia Refrigeration (IIAR)
1001 North Fairfax Street
Suite 503
Alexandria, VA 22314, USA
www.iiar.org

Occupational Safety and Health Administration (OSHA)
United States Department of Labor
Washington, DC 20210, USA
www.osha.gov
www.dol.gov
www.osha.gov/tdc

United States Environmental Protection Agency (EPA)
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460, USA
www.epa.gov

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Appendix C (Informative)

Decommissioning Check List - Example

~~(Example of) Decommissioning Check List~~		
~~Date:~~		
~~Facility Name:~~		
~~Location:~~		
~~Description of Decommissioning Activities:~~		
	~~Date Completed~~	~~Verified By~~
~~Suspend or Modify Daily Operations~~		
~~Contact Local Representatives~~		
~~Restrict Access at the Facility~~		
~~Limit or Control Access by Motorized Equipment~~		
~~Tank Trucks Parked near System~~		
~~Labels, Signs and Placards Installed~~		
~~Precautions and General Steps Documented~~		
~~Training and Safety Meetings Completed~~		
~~Regulatory Requirements Met~~		
~~Equipment and Tools Assembled~~		
~~Manpower Assembled~~		
~~COMMENTS:~~		

Decommissioning Check List		
Date:		
Facility Name:		
Location:		
Description of Decommissioning Activities:		
	Date Completed	Verified By

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Preparation:		
Initial Planning:		
Reason(s) for decommissioning		
Designation of person(s) coordinating the decommissioning activities		
Specify what is being decommissioned		
Areas of facility to be shutdown		
Transfer to and/or stored location identified		
Disposal means identified		
Dismantled or abandoned (left in place) list		
Management of Change Procedure(s)		
Documentation Requirements:		
Physical properties (MSDS, SDS, IIAR Ammonia Book Data)		
Process flow diagrams & P&ID's		
Facility plan view		
Pressure relief valves information		
Emergency Action and/or Response Plan		
Coordination Meeting(s):		
Decide to suspend or modify daily operations		
Identify facility areas to be restricted		
Identify if site security changes are needed		
Decide to limit and/or control motorized vehicle access		
Identify accumulation and transfer vessel(s)		
Identify tank truck parking and connections		
Determine labels, signs, or placards needed		
Identify inspections and precautions needed		
Define steps for hose inspections		
Determine removal, transfer and/or flush procedures		
Determine if valves need to be modified and/or installed		
Determine if any instrumentation needs to be modified (e.g. pressure or temperature gauges).		
Determine if insulation needs to be removed		
Determine if access changes are needed		
Identify pressure and temperature limitations		

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Determine communication equipment needed		
Determine PPE needed		
Ensure Eyewash/Shower equipment is available		
Determine detection methods during decommissioning activities		
Determine emergency shutdown and qualified emergency responders		
Determine ventilation system operations during decommissioning activities		
Determine disposal compliance requirements		
Determine manpower requirements		
Determine if additional training is needed		
Determine if Emergency Action and/or Response plan needs to be modified		
Contact local Fire Department and LEPC and provide summary of activities		
Decommissioning Precautions and Steps:		
Description or list of discussion items for to be covered with those directly involved		
References to existing safety programs (e.g. lockout/tagout, line breaking, hot work permit, confined space entry procedures)		
Description of safety systems that will function during activities (e.g. ammonia detection, ventilation, pressure relief, and emergency shutdown)		
Steps that shall be taken during decommissioning activities		
Precautions that shall be taken during decommissioning activities to prevent trapping liquid		
Precautions to ensure temperatures do not drop below the minimum design temperature and address flashing of subcooled liquid		
Precautions to ensure pressures do not exceed the maximum allowable pressure		
Precautions to avoid rapid release of pressure from one portion of the system to another portion of the system		
Precautions to avoid liquid being released into equipment, components and piping under a vacuum		
Precautions to assure liquid levels remain within safe limits in the vessels		
Precautions to avoid any excessive vibration, shocks or movement of any part of the system being decommissioned		
Precautions to ensure valves will not be inadvertently opened or closed during		

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activities (e.g. list of valves involved that will be marked or flagged)		
Steps that shall be taken for emergency shutdown and isolation		
Training:		
Additional Training: For those facility personnel and/or contractors who will be performing the decommissioning activities		
An overview of the decommissioning activities		
Safety, health hazards and properties of ammonia, oil, and other chemicals involved including first aid for exposure		
Review of considered initial planning items		
Review of coordination meeting(s) items		
Review of the applicable and anticipated operating limits (e.g. temperatures, pressures and levels)		
Description of the actions that shall be taken if the operating limits deviate from the expected values		
A review of the decommissioning precaution and general steps that shall be followed during the decommissioning activities		
A review of emergency action and/or response operations that include steps for shutdown and isolation		
A review of safety programs (e.g. lockout/tagout, line breaking, hot work permit, confined space entry procedures)		
Awareness Training: For all personnel who could be affected by the decommissioning activities		
An overview of the decommissioning activities and its effects on the daily operations		
A description of the safety, health hazards and properties of ammonia, oil, and other chemicals including first aid for exposure		
A review of emergency action and/or response procedures including how to initiate an alarm, evacuation and release reporting procedures		
Regular (daily or weekly) Safety Meetings: For all personnel and/or contractors involved		
Review of work activities		
Review of safety practices		
Address any concerns		
Records:		

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Training summary sign-off sheets		
Training provided and any materials from training activities. (e.g. agenda, handouts, manuals, attendance lists)		
Documents showing special qualifications (e.g. welding certifications, PPE training - use of respirators)		
Regulatory Requirements:		
Confirm decommissioning activities comply with applicable codes, standards and regulations		
Management of Change Procedure initiated		
Review of the impact of safety and health		
Identification of documentation that needs to be modified		
Pre-startup Procedures		
Equipment:		
Equipment Requirements (e.g. specific consumables, tools and equipment) to be available		
Materials are confirmed to be ammonia compatible and safe for subject use		
Maintenance of Equipment and Tools		
Hoses rated for ammonia service and within their service life		
Eyewash and body showers		
Fixed and/or portable ammonia detectors		
Emergency shutdown and isolation Equipment		
Fixed and/or portable ventilation units		
Operations:		
Prepare Facility:		
Suspend or modify operations		
Ensure decommissioning precautions and general steps are written		
Ensure training and safety meetings have been completed		
Ensure regulatory requirements have been met including the Management of Change Procedure		
Assemble and/or install specific equipment and tools to be used		
Assemble manpower needed		
Decommissioning Activities:		
Raising/lowering pressure on the system components to transfer ammonia to a vessel, tank truck and/or tank.		

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Use of a vessel(s), tank truck(s), and/or a tank(s) for transfer accumulation		
Safely applying heat to evaporate residual liquid ammonia		
Using service valves to remove any remaining low point ammonia and/or oil		
Flushing the system or subsystem with an inert gas (e.g. nitrogen) to remove residual ammonia vapor (purging the gas to water is an option to keep it from discharging directly to the atmosphere)		
Physically removing equipment, components or piping following safe work practices (e.g. lockout/tagout, line breaking, hot work permit and confined space entry procedures).		
Ammonia Disposal:		
Ensure removed lubricating oil that might contain residual ammonia is completely de-gassed before placing in a sealed non-pressure lubricant receptacle		
Disposal of all chemicals, including ammonia/water solutions, is in compliance with applicable codes, standards, and regulations		
Obtain tracking information (e.g. shipping waybills and endpoint receipts) of all chemicals removed from the facility		
Close-out:		
Management of Change Procedure(s):		
Ensure facility documentation has been Updated		
Ensure any action items identified have been addressed and the resolutions have been documented		
Ensure the training has been completed and documented		
Ensure that the pre-startup procedures have been completed and documented if applicable		
Ensure authorization signatures have been obtained on the form(s)		
Notification Procedure(s):		
Notify representatives from the Fire Department and the LEPC that the decommissioning is completed		
Notify applicable government agencies		
COMMENTS:		

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